51-

KENWOOD

SERVICE MANUAL

Model TL-120



LINEAR AMPLIFIER

CONTENTS/SPECIFICATIONS

SPECIFICATIONS

Transmit Frequency Range:	3.5 MHz ~ 29.7 MHz
Exciter Power:	10W
Collector Input:	3.5 MHz ~ 21 MHz, 160W 28 MHz, 140W
Input, Output Impedance:	50Ω
Power Supply:	DC 12 ~ 16V (13.8V)
Power Consumption:	15A (DC 13.8V)
Semiconductor Complement:	
Transistors:	20
Diodes:	22
Dimentions:	123 (123) Wide x 97 (107) High x 235 (265) Deep Values in parenthesis include protrusions.
Weight:	2.3 kg

NOTE:
Specifications are subject to change for improvements.

FEATURE/CIRCUIT DESCRIPTIONS

FEATURES

- All solid state medium power linear amplifier for TS-120V.
- A DC input power of 160W or more (150W or more at 28 MHz band).
- ALC circuit, power reduction circuits for protection against mis-matched load, and supply voltage drop, to prevent from distorted RF signal over-drive.
- Effective fan cooling for power transistor protection (The fan is controlled from radiator temperature).
- Protection circuits to protect power transistors
  1. Erroneous band switch setting protection circuit
  2. Radiator overheat protection circuit
  3. Output transformer overheat protection circuit
- Motorola SRF1714 as power amplifier.
- Collector current measuring terminals.
- Easy to connect with TS-120V and PS-30. With connection cable.
  (PS-30 on-off control by power switch of TS-120.)

CIRCUIT DESCRIPTION

ALC Circuit

The output; travelling wave level is monitored, and the output power kept to 95W at 14 MHz, 50Ω load.
For bands other than 28 MHz band, detected voltage is divided across resistors, and applied to the ALC control amplifier. The output power is therefore higher at 21 MHz or the lower band than at the 28 MHz band. The dividing ratio is selected so that about 70W is obtained at the 28 MHz band when 95W is obtained at the 14 MHz band. The divider ON/OFF transistor switch is controlled by the band selector.

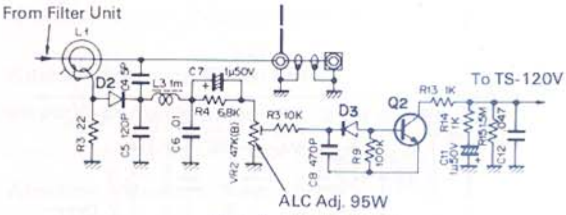


Fig. 2 ALC Circuit

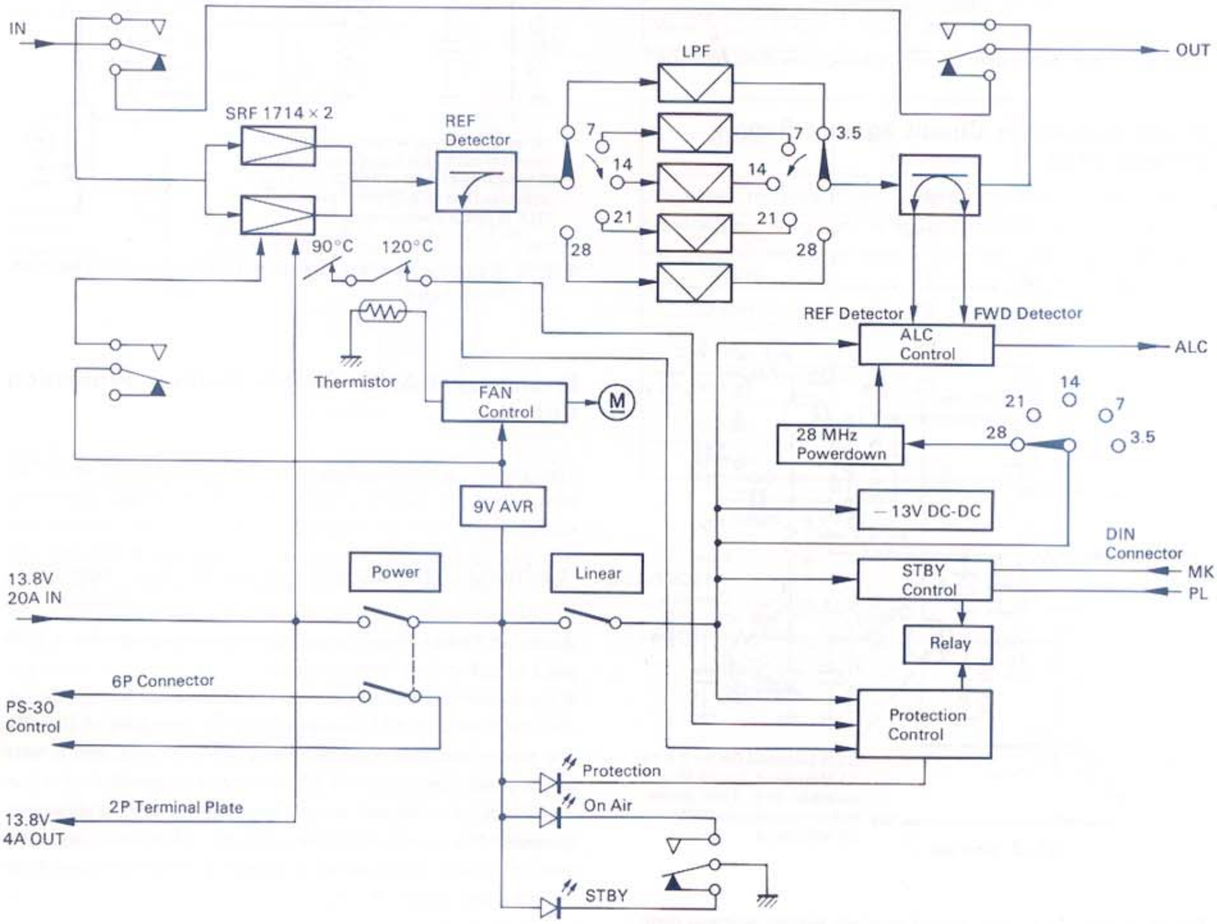


Fig. 1 Block Diagram

CIRCUIT DESCRIPTION

Power Reduction Circuit against Mis-matched Load

When the load impedance is other than 50Ω (VSWR > 1), the ALC circuit tries to keep the travelling wave level at the rated level so that the power transistors are not overdriven. In such a case, the power loss and amplifier deterioration increases eventually leading to breakdown. To prevent this, the reflected wave is detected and used to regulate down the amplifier driving power. The power amplifier operates then as if the supply voltage is lowered. The circuit is designed so that the travelling wave level is decreased to about 35W when a load of 150Ω is connected (VSWR = 3).

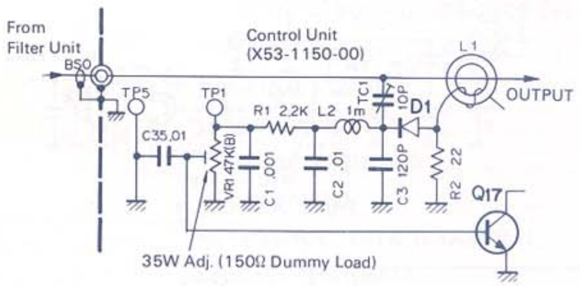


Fig. 3 Power reduction circuit against mis-matched load

Power Reduction Circuit against Supply Voltage Drop

If the supply voltage drops, the maximum allowable amplitude of the collector voltage of the power transistors is lowered. However, the ALC circuit operates to keep the rated output power, resulting in overdrive of the power amplifier. This, increase in distortion causes unstable operation of the amplifier. To prevent this, the ALC threshold level is regulated by the supply voltage so that the limited power level by ALC is reduced when the supply voltage drops. When the supply voltage rises, the limited power level by ALC also increases, and, a circuit which is provided keeps the output power constant if the supply voltage exceeds about 14V.

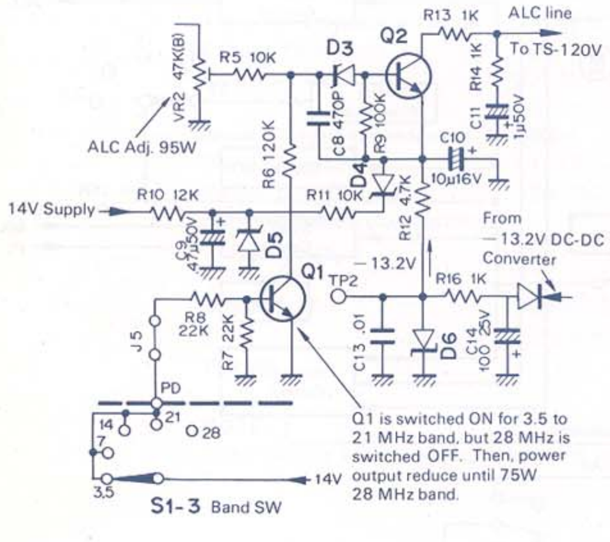


Fig. 4 Power reduction circuit against supply voltage drop and power reduction circuit for 28 MHz

Radiator Temperature Control Fan Circuit

A thermistor is mounted on the radiator for power amplifier control of the cooling fan. (The circuit is the same as that used for TS-120S.) Even if the LINEAR switch is turned to set the linear amplifier in a standby state, the cooling fan continues to operate until the radiator temperature drops to a certain level.

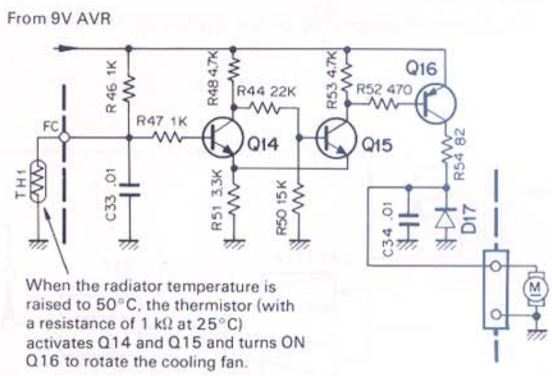


Fig. 5 Radiator temperature detecting type cooling fan control circuit

Erraneous BAND Switch Setting Protection Circuit

The power amplifier is a push-pull broad-band amplifier which has no tuning circuit. Therefore, higher harmonic components must be suppressed by some other means. For this purpose, a LPF is provided for each band and the LPF used is selected by the BAND switch. The input impedance of LPF viewed from the power amplifier varies greatly at frequencies higher than the cut-off frequency even if the 50Ω load is connected to the output.

If the exciter frequency exceeds the LPF cut-off frequency, i.e. the band setting of TS-120V is different from that of TL-120, the power amplifier load is greatly mis-matched, and results in an abnormal operation of the power transistors. To prevent this, a reflected wave detection circuit is provided between the power amplifier and LPF. This circuit actuates the protection circuit when it detects a reflected wave from an incorrect band setting.

CIRCUIT DESCRIPTION/SEMICONDUCTOR DATA

The protection circuit places TL-120 on standby and is directly connected to the antenna.
To relase the protection circuit, set the exciter to receive and the BAND switch of TL-120 to the same band as the exciter. Set the LINEAR switch to the STBY position. After the PROTECTION Indicator goes off, switch from LINEAR to OPERATE. This protection circuit functions only when the exciter frequency is higher than the LPF cut-off frequency (band setting of TL-120 $<$ band setting of TS-120V). When band setting of TL-120$>$ band setting of TS-120V, the input impedance of LPF matches with the power amplifier, and the protection circuit is inoperative. However, higher harmonic components may pass through LPF, resulting in deterioration of the transmitted signal quality. When a problem occurs in the antenna system and VSWR increases greatly, this protection circuit may cut in before the power reduction mismatched protection circuit.

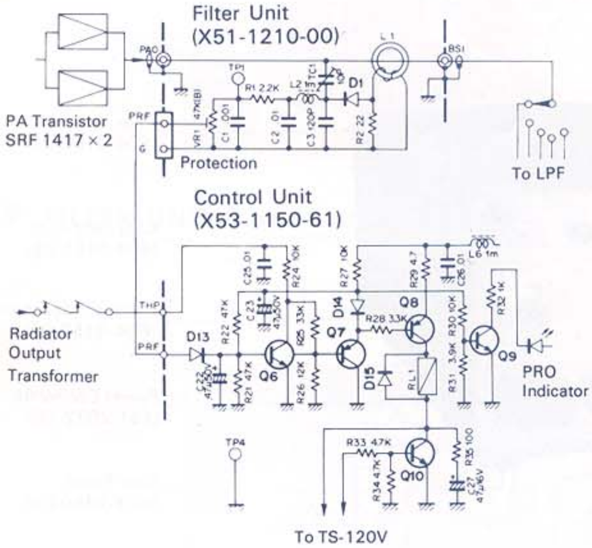


Fig. 6 Erroneous BAND switch setting protection circuit, Radiator and output transformer overheat protection circuits

Radiator and Output Transformer Overheat Protection

In the normal operation, the cooling fan prevents the power transistor temperature from rising greatly. However, if the ventilation is not sufficient, transmission is continuous, or if the cooling fan circuit mal functions, this temperature may rise steeply. As a precaution, two overheat protection circuits are provided. One is a thermostat which detects and opens when the temperature of the radiator exceeds 90°C. The other also a thermostat connects the output transformer and opens when the temperature exceeds 170°C. When one of these thermoswitches opens, TL-120 is brought into STBY and TS-120V is connected directly to the antenna. If any of these protection circuits operate, set the LINEAR switch to the STBY position, take countermeasures to cool the instrument until the PROTECTION indicator goes off. (Protection will not be released unless the LINEAR switch is set to the STBY.

Collector Current Measuring Terminals

A 15 mΩ shunt resistor is provided in the collector power supply circuit of the power transistors. Measuring terminals are connected to the both ends of the resistor. The collector current is found by measuring the voltage across the resistor. As a correction circuit is provided, a precise value can be obtained. The conversion rate is 10A/0.1V.

Semiconductor Data

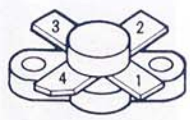
SRF 1714 V08-1011-06 (Q1, 2 on the PA Unit)

Application: RF band power amplifier

Absolute Maximum Ratings (TA = 25°C)

Item	V_{CEO}	V_{CBO}	V_{EBO}	Ic	P_D	Tstg	$R_{\theta}JC$
Value	25V	45V	4.0V	20A	250W	−65 ~ 200°C	0.7° C/W

Color	hfe	
	Minimum	Maximum
Red	20	32
Orange	28	42
Yellow	38	52
Green	48	63
Blue	57	78
Violet	72	93
Black	87	108
Brown	100	120



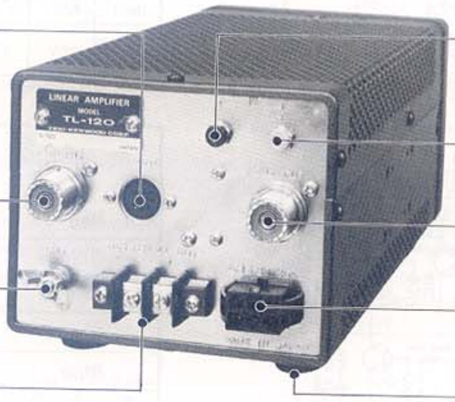
1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

OUTSIDE VIEWS/INSIDE VIEWS

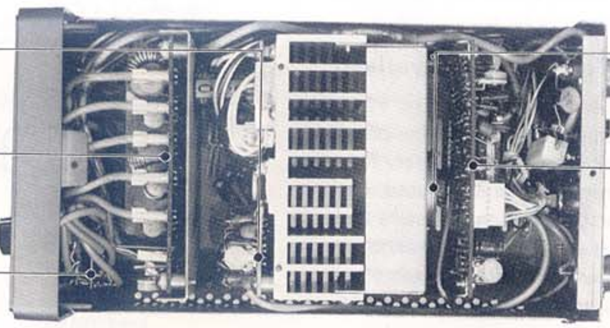
FRONT PANEL



REAR PANEL

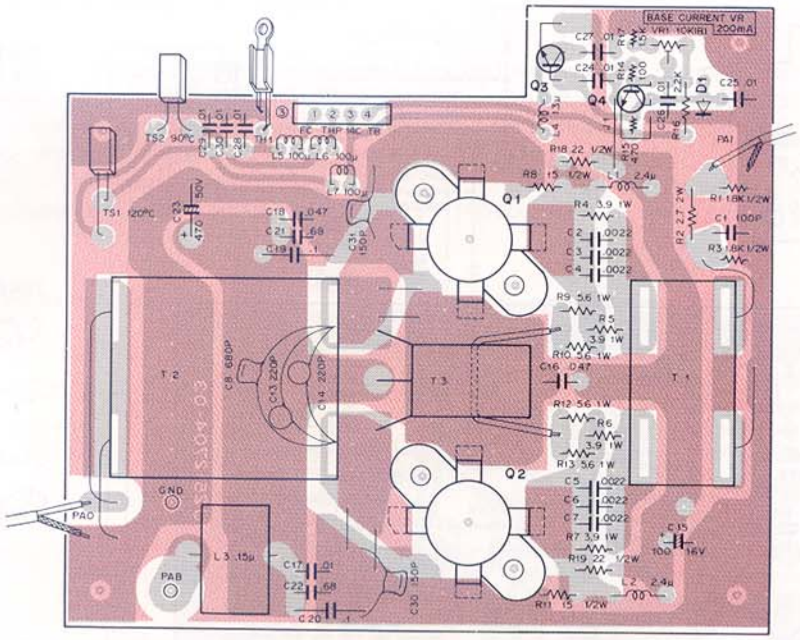


TOP VIEWS



PC BOARD

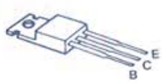
▼ PA UNIT (X45-1130-00)



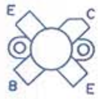
2SC733 (Y)



2SD235 (Y)

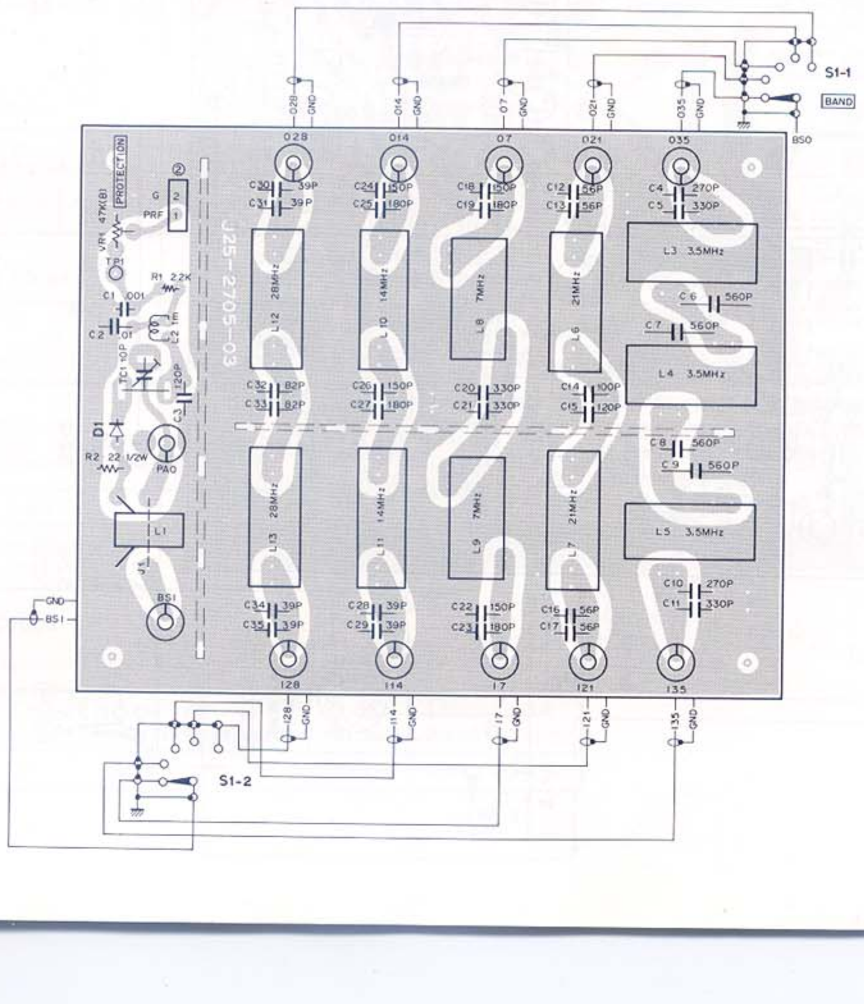


SRF1714



Q1,2	:	SRF1714
Q3	:	2SD235(Y)
Q4	:	2SC733(Y)
D1	:	SV-03

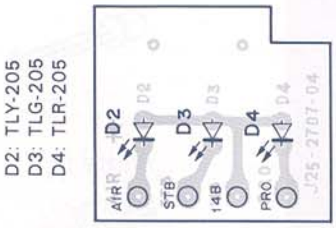
▼ FILTER UNIT (X51-1210-00)



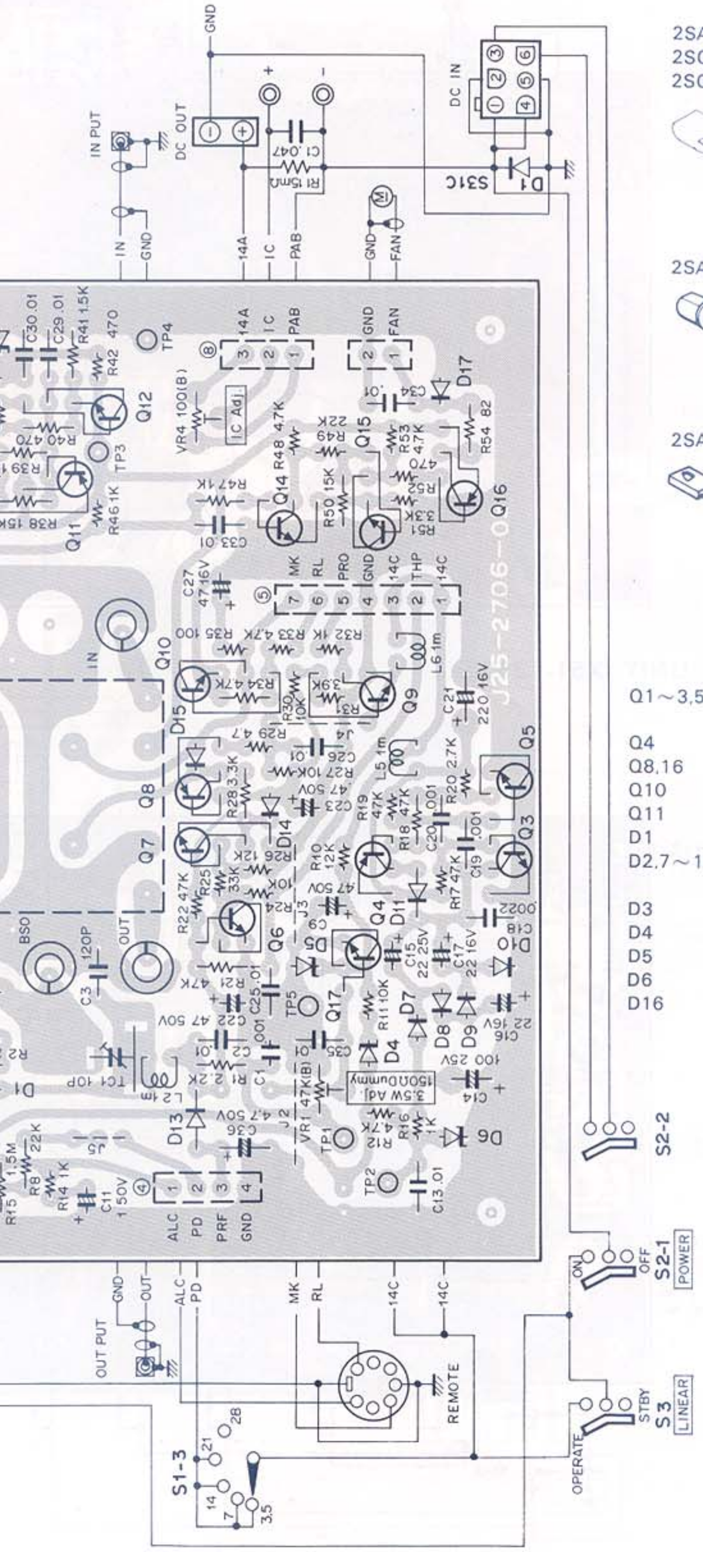
D1: 1N60

PC BOARD

▼ LED PC BOARD (J25-2707-04)



▼ CONTROL UNIT (X53-1150-61)





Q1~3,5~7,9,12~15,17	:	2SC1815(Y)
Q4	:	2SA1015(Y)
Q8,16	:	2SA562(Y)
Q10	:	2SC1959(Y)
Q11	:	2SA496(Y)
D1	:	1N60
D2,7~11,13~15,17	:	1S1555
D3	:	XZ-142
D4	:	XZ-162
D5	:	WZ-090
D6	:	XZ-132
D16	:	WZ-061

PARTS LIST

Note 1:
K: U.S.A. W: Europe T: Britain

Note 2:
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the PC board illustration. Resistors not otherwise detailed are carbon type (1/4 or 1/8W).
Order carbon resistors and capacitors according to the following example:
A carbon resistor's part number is RD14BY 2E222J.
A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

RESISTOR

1. Type of the carbon resistor



RD14BY



RD14CY

2. Wattage

1/4W → 2E
1/8W → 2B

3. Resistance value

2 2 2 → means 22 × 10^2 = 2200Ω (2.2 kΩ)

Significant figure Multiplier

Example: 221 → 220Ω 224 → 220 kΩ
222 → 2.2 kΩ 225 → 2.2 MΩ
223 → 22 kΩ

4. Tolerance
J = ±5% (Gold)
K = ±10% (Silver)

CAPACITORS

Type I

CK	45	F	1H	103	Z
1	2	3	4	5	6

Type II

CC	45	TH	1H	220	J
1'	2	3'	4	5	6

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ... round, square, etc.
3 = Temp. range
3' = Temp. coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

6 = Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10μF −10∼+50 Less than 4.7μF −10∼+75

Less than 10 pF

Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

3 = CK45F

Ceramic capacitor (Type I) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

3' = CC4500 .....

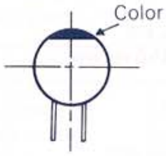
Ceramic capacitor (Type II) temperature coeff. capacitor 1' 3'.

1st word (Color)	CH (Black)	LH (Red)	PH (Orange)	RH (Yellow)	SL (Green)	TH (Blue)	UH (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

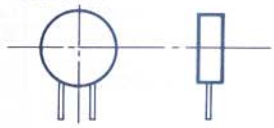
5 = Capacitor value

Example: 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001 μF
103 → 0.01 μF

CC45.....



CK45 .....



Type II 45

PARTS LIST

GENERAL ☆ New parts

Ref. No.	Parts No.	Description	Re-marks
C1	CK45F1H473Z	Ceramic 0.047μF +80%, −20%	
R1	R92-0620-05	Cement resistor 5mΩ	
D1	V11-2163-86	Diode S31C	
D2	V11-3163-16	LED TLY-205	
D3	V11-3162-86	LED TLG-205	
D4	V11-3162-96	LED TLR-205	
S1	S01-2420-05	Rortary switch BAND	☆
S2,3	S36-2404-05	See-Saw switch POWER, MODE	☆
	A01-0732-03	Case (A)	
	A01-0758-02	Case (B)	☆
	A20-2367-03	Panel	☆
	A23-1440-04	Rear panel	☆
	B39-0407-04	Spacer × 2 for assistance leg	
	B50-2681-00	Operating manual	☆
	E04-0152-05	M type receptacle × 2 OUTPUT, INPUT	
	E06-0151-05	Chip JACK (Red) Ic terminal	☆
	E06-0102-05	Chip JACK (Black) Ic terminal	☆
	E06-0751-05	7P DIN Socket REMOTE	
	E20-0282-05	2P terminal plate DC13.8V 4A OUT	
	E30-1637-05	Cable	
	E30-1638-05	DC cord	
	E30-1640-05	REMOTE Cable	
	E31-2018-05	Coaxial Cable A BAND	☆
	E31-2022-05	Square Connector	
	F05-2034-05	Fuse (20A) × 2	
	F09-0405-04	Fan	
	H01-2647-04	Carton	☆
	H10-2513-02	Front packing fixture (F)	
	H10-2514-03	Rear packing fixture (R)	
	H12-0465-04	Cushion	☆
	H20-1407-03	Protective cover	
	H25-0029-04	Protective bag 60 × 110 mm	
	H25-0112-04	Protective bag 180 × 250 mm	
	J02-0323-05	Foot × 4	
	J02-0409-04	Accistance foot	
	J13-0404-05	Fuseholder	
	J19-1317-04	Diodeholder	
	J61-0201-05	Vinyle tie	
	K21-0723-04	Pointer knob BAND SW	
	N09-0256-05	Earth screw × 3	
	N14-0509-05	Wing nut GND terminal	
	T40-0301-05	FAN motor	
	X42-1120-10	Coaxial cable ass'y	
	X45-1130-00	PA unit	☆
	X51-1210-00	FILTER unit	☆
	X53-1150-00	CONTROL unit	☆

PA UNIT (X45-1130-00)

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C1	CC45SL2H101J	Ceramic 100pF ±5%	
C2~7	CK45D2H222M	Ceramic 0.0022μF ±20%	
C8	CM93D2H681J	Mica 680pF ±5%	
C13,14	CC45SL2H221J	Ceramic 220pF ±5%	
C15	CE04W1C101Q	Electrolytic 100μF 16W	
C16	C91-0465-05	Ceramic 0.047μF 25V	
C17	CK451H103Z	Ceramic 0.01μF +80, −20%	
C18	C91-0456-05	Ceramic 0.047μF 25V	
C19,20	CK45F1H104Z	Ceramic 0.1μF +80, −20%	
C21,22	C91-0448-05	Layer built 0.68μF	
C23	CE04W1H471Q	Electrolytic 470μF 50WV	
C24~30	CK45F1H103Z	Ceramic 0.01μF +80, −20%	
C10,12	NOT USED.		
C30,31	CM93D2H151J	Mica 150pF ±5%	
		RESISTOR/POTENTIO METER	
R2	RS14AB3D2R7J	Metal 2.7Ω ±5% 2W	
R4~7	RS14AB3A3R9J	Metal 3.9Ω ±5% 1W	
R9,10	RS14AB3A5R6J	Metal 5.6Ω ±5% 1W	
R12,13	RS14AB3A5R6J	Metal 5.6Ω ±5% 1W	
R1,3 8,11	RC05GF2H○○○J	Solid ○○○Ω ±5% 1/2W	
R14~17	RD14CB2E○○○J	Carbon ○○○Ω ±5% 1/4W	
VR1	R12-3419-05	Semi-fixed resistor 10kΩ (B)	☆
		SEMICONDUCTOR	
Q1,2	V08-1011-06	Transistor SRF1714	
Q3	V04-0046-05	Transistor 2SD235(Y)	
Q4	V03-0183-05	Transistor 2SC733(Y)	
D1	V22-0031-05	Diode SV-03	
		COIL/TRANSFORMER	
L1,2	L33-0624-05	Choke coil 2.4μH	
L3	L33-0622-15	Choke coil B 15μH	
L4	L33-0025-05	Choke coil 1.3μH	
L5~7	L40-1011-03	Ferri-inductor 100μH	
T1	L13-0305-05	Input matching transformer	
T2	L19-0312-05	Output transformer	
T3	L19-0313-15	NF Transformer	
		MISCELLANEOUS	
TH1	V11-2260-16	Thermistor STP31L	
TS1	S59-1403-05	Thermostat (insulating type 120°C)	
TS2	S59-1404-05	Thermostat (insulating type 90°C)	
	E31-0451-05	Cable A DC (RED)	
	E31-0452-05	Cable B DC (BLACK)	
	F20-0078-05	Insulating mica	
	F29-0014-05	Insulating washer	
	J31-0510-04	Spacer × 4	

PARTS LIST

FILTER UNIT (X51-1210000)

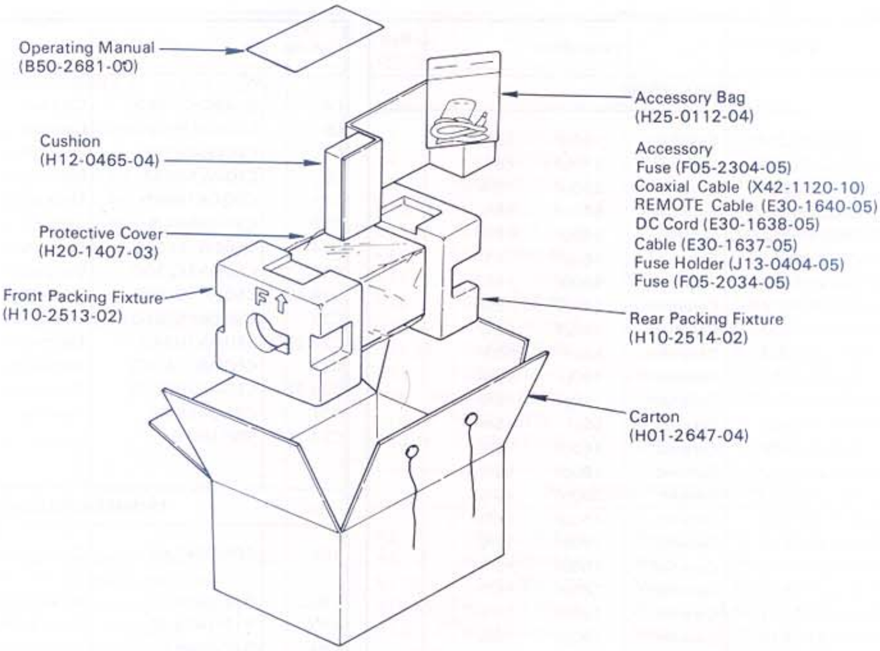
Ref. No.	Parts No.	Description			Re-marks
		CAPACITOR			
C3	CC45CH1H121J	Ceramic	120pF	±5%	
C4	CC45SL2H271J	Ceramic	270pF	±5%	
C5	CC45SL2H331J	Ceramic	330pF	±5%	
C6	CC45SL2H561J	Ceramic	560pF	±5%	
C7	CC45SL2H561J	Ceramic	560pF	±5%	
C8	CC45SL2H561J	Ceramic	560pF	±5%	
C9	CC45SL2H561J	Ceramic	560pF	±5%	
C10	CC45SL2H271J	Ceramic	270pF	±5%	
C11	CC45SL2H331J	Ceramic	330pF	±5%	
C12,13	CC45SL2H560J	Ceramic	56pF	±5%	
C14	CC45SL2H101J	Ceramic	100pF	±5%	
C15	CC45SL2H121J	Ceramic	120pF	±5%	
C16,17	CC45SL2H560J	Ceramic	56pF	±5%	
C18	CC45SL2H151J	Ceramic	150pF	±5%	
C19	CC45SL2H181J	Ceramic	180pF	±5%	
C21,21	CC45SL2H331J	Ceramic	330pF	±5%	
C22	CC45SL2H151J	Ceramic	150pF	±5%	
C23	CC45SL2H181J	Ceramic	180pF	±5%	
C24	CC45SL2H151J	Ceramic	150pF	±5%	
C25	CC45SL2H181J	Ceramic	180pF	±5%	
C26	CC45SL2H151J	Ceramic	150pF	±5%	
C27	CC45SL2H181J	Ceramic	180pF	±5%	
C28～31	CC45SL2H390J	Ceramic	39pF	±5%	
C32,33	CC45SL2H820J	Ceramic	82pF	±5%	
C34,35	CC45SL2H390J	Ceramic	39pF	±5%	
		TRIMMER/POTENTIOMETER			
TC1	C05-0042-05	Ceramic trimmer	10pF		
VR1	R12-3054-05	47kΩ(B) PROTECTION Adj.			
		SEMICONDUCTOR/COIL			
D1	V11-0051-05	Diode 1N60			
L1	L39-0406-05	Detector coil			
L2	L40-1021-03	Ferri-inductor	1mH		
L3～5	L34-0896-05	Filter coil (A)	3.5 MHz		
L6,7	L34-0829-05	Filter coil (D)	21 MHz		
L8,9	L34-0827-05	Filter coil (B)	7 MHz		
L10,11	L34-0828-05	Filter coil (C)	14 MHz		
L12,13	L34-0830-05	Filter coil (E)	28 MHz		
		MISCELLANEOUS			
	E04-0154-05	Coaxial connector × 12			☆
	E23-0047-05	Terminal			
	J31-0502-04	PC Board color			
	J42-0404-05	PC Board bush			

CONTROL UNIT (X53-1150-61)

Ref. No.	Parts No.	Description			Re-marks
		CAPACITOR			
C3	CC45CH1H121J	Ceramic	120pF	±5%	
C4	CC45CH2H050C	Ceramic	5pF	±0.25pF	
C5	CC45CH1H121J	Ceramic	120pF	±5%	
C7	CE04W1H010	Electrolytic	1μF	50WV	
C9	CE04W1HR47	Electrolytic	0.47μF	50WV	
C11	CE04W1H010	Electrolytic	1μF	50WV	
C12	C91-0456-05	Ceramic	0.047μF	25V	
C14	CE04W1E101Q	Electrolytic	100μF	25WV	
C15	CE04W1E220Q	Electrolytic	22μF	25WV	
C16,17	CE04W1C220Q	Electrolytic	22μF	16WV	
C21	CE04W1C221Q	Electrolytic	220μF	16WV	
C22,23	CE04W1HR47	Electrolytic	0.47μF	50WV	
C27	CE04W1C470Q	Electrolytic	47μF	16WV	
C28,32	CE04W1C221Q	Electrolytic	220μF	16WV	
C37	C91-0456-05	Ceramic	0.047μF	25V	
C24	NOT USED				
		TRIMMER/POTENTIOMETER			
TC1	C05-0042-05	Ceramic trimmer	10pF		
VR1,2	R12-3054-05	47 kΩ (B) 35W Adj. ALC Adj.			
VR3	R12-1406-05	1 kΩ (B) 9VAVR Adj.			
VR4	R12-0408-05	100Ω (B) Ic Adj.			
		SEMICONDUCTOR			
Q1～3	V03-1815-06	Transistor	2SC1815(Y)		
Q4	V01-1015-06	Transistor	2SA1015(Y)		
Q5～7	V03-1815-06	Transistor	2SC1815(Y)		
Q8	V01-0032-05	Transistor	2SA562(Y)		
Q9	V03-1815-06	Transistor	2SC1815(Y)		
Q10	V03-1959-06	Transistor	2SC1959(Y)		
Q11	V01-0113-05	Transistor	2SA496(Y)		
Q12～15	V03-1815-06	Transistor	2SC1815(Y)		
Q16	V01-0032-05	Transistor	2SA562(Y)		
Q17	V03-1815-06	Transistor	2SC1815(Y)		
D1	V11-0051-05	Diode	1N60		
D2	V11-0076-05	Diode	1S1555		
D3	V11-4171-06	Zener diode	XZ-142		
D4	V11-4172-06	Zener diode	XZ-162		
D5	V11-0240-05	Zener diode	WZ-090		
D6	V11-4162-16	Zener diode	XZ-132		
D7～11, 13～15	V11-0076-05	Diode	1S1555		
D16	V11-0243-05	Zener diode	WZ-061		
D17	V11-0076-05	Diode	1S1555		
D12	NOT USED.				
		COIL			
L1	L39-0406-05	Detector coil			
L2,3, 5,6	L40-1021-03	Ferri-inductor	1 mH		
		MISCELLANEOUS			
RL1	S51-4402-05	Relay			
	E04-0154-05	Coaxial connector × 4			☆
	E23-0047-04	Terminal × 5			

PACKING/DISASSEMBLY

PACKING



DISASSEMBLY

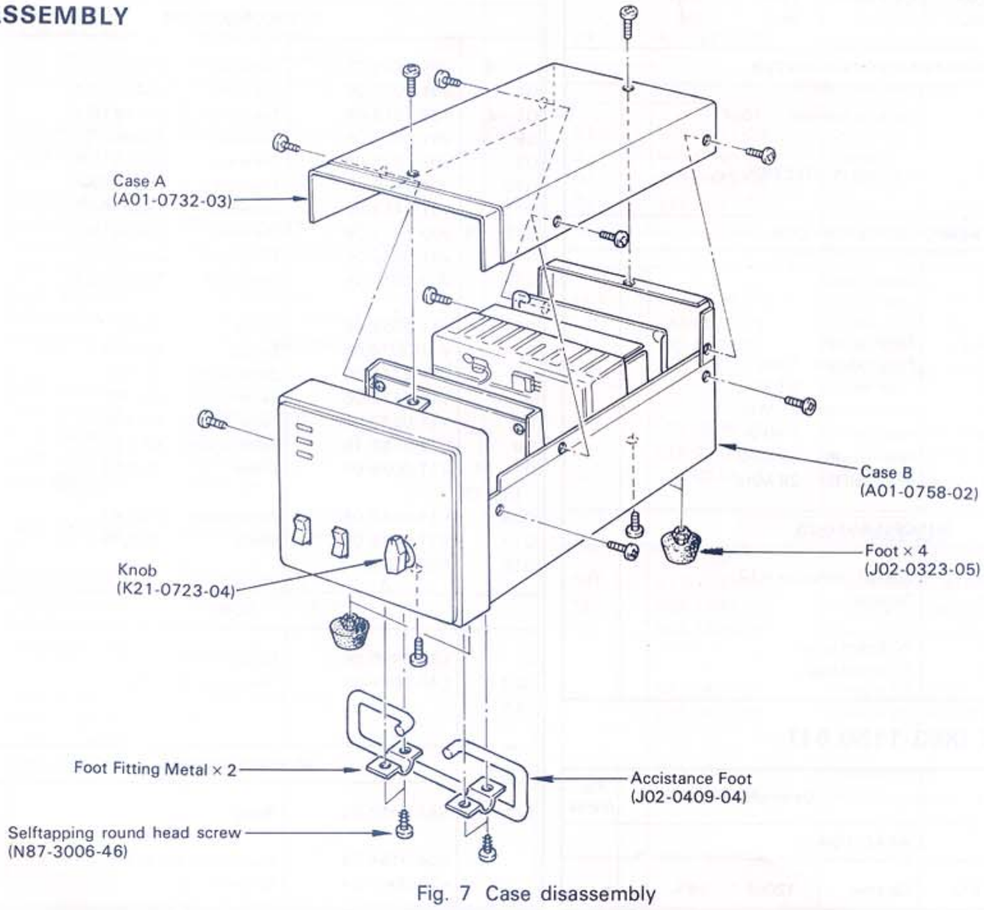


Fig. 7 Case disassembly

DISASSEMBLY

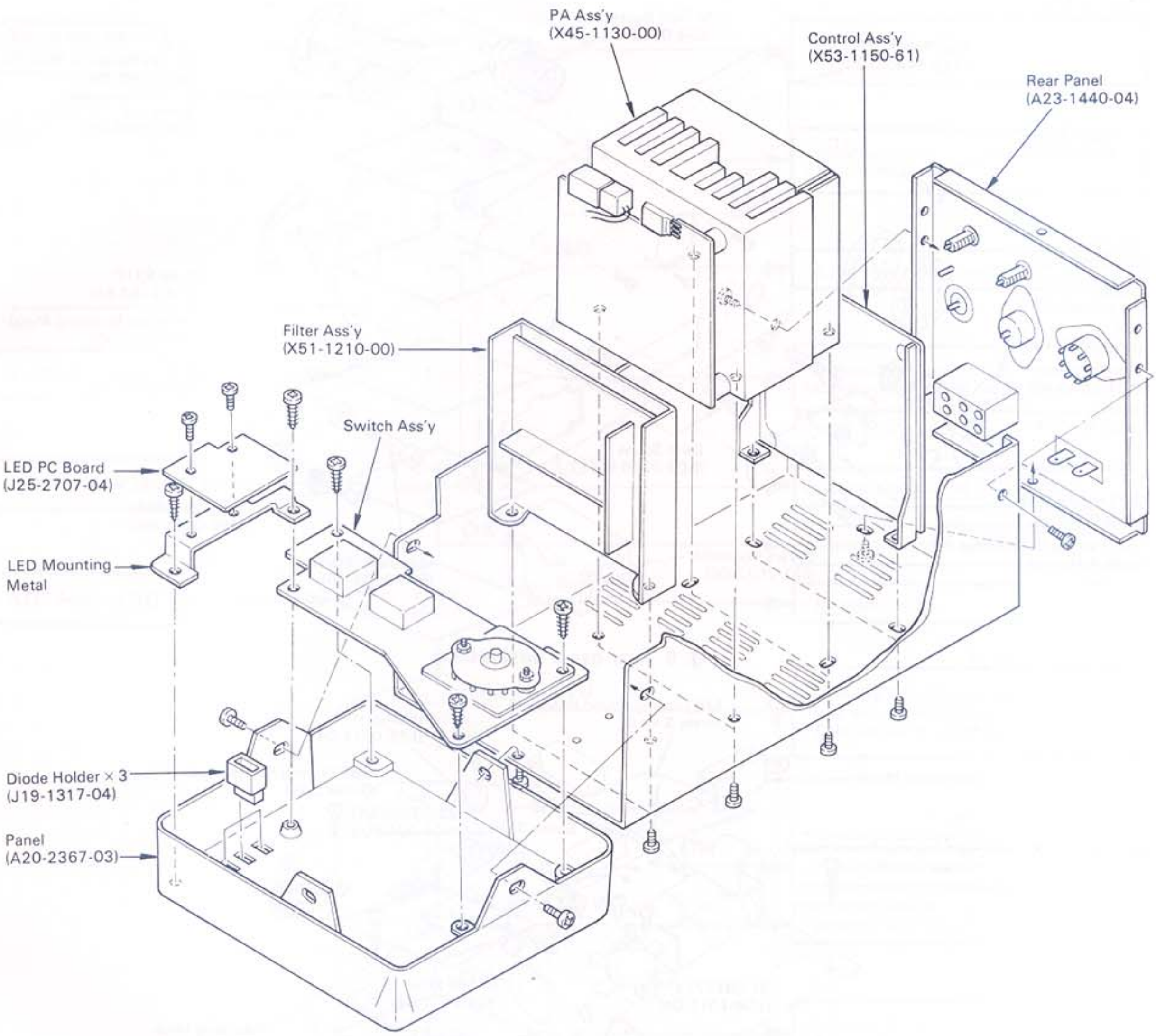


Fig. 8 Frontpanel disassembly/Mounting PC Board

DISASSEMBLY

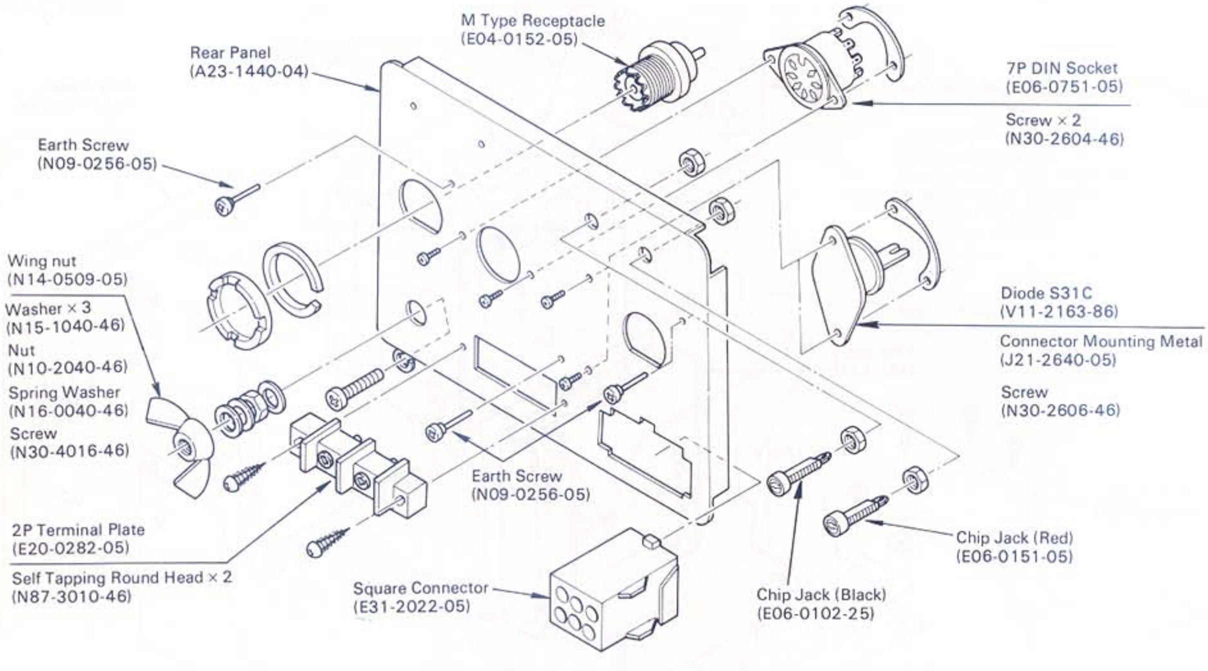


Fig. 9 Rear panel disaasembly

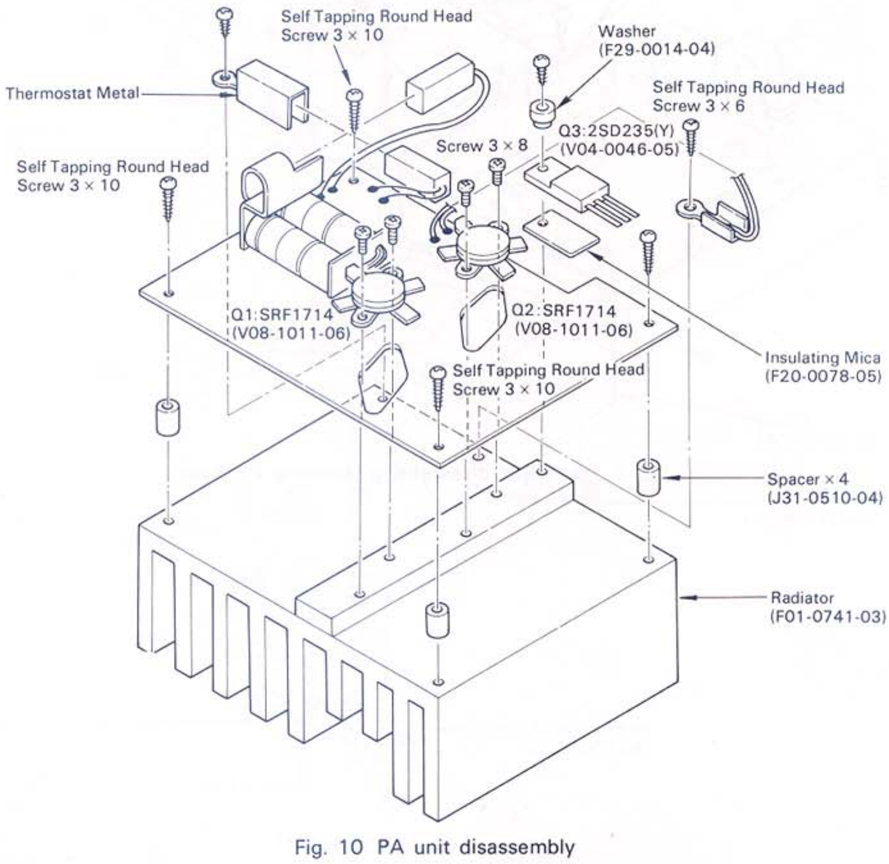
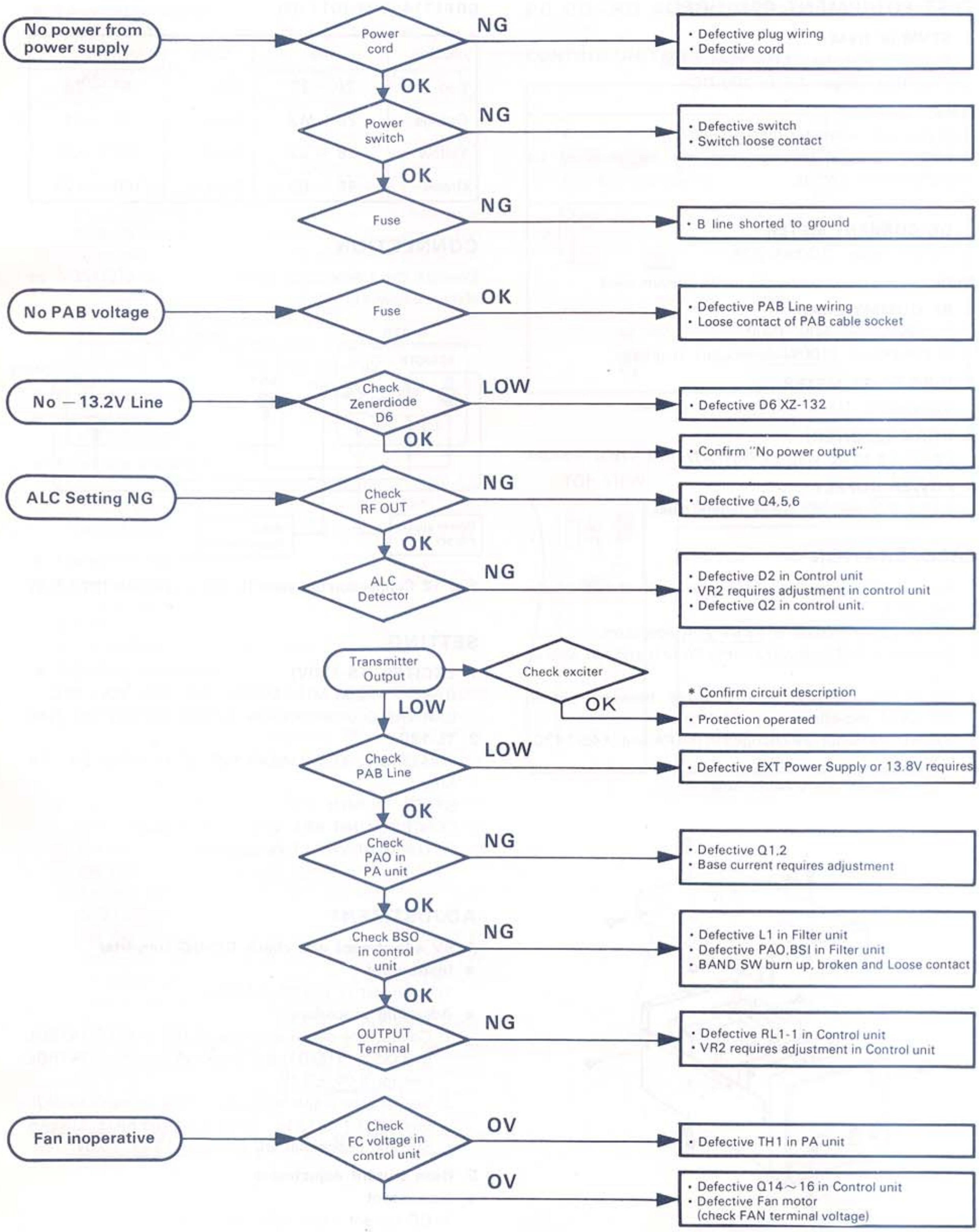


Fig. 10 PA unit disassembly

TROUBLESHOOTING



ADJUSTMENTS

TEST EQUIPMENT REQUIRED

1. STVM or DVM

1) Input resistance: More than 1 MΩ
2) Voltage range: 1.5 to 20V DC

Note:
High-precision voltmeter maybe used.
However accurate readings can not be obtained for high-impedance circuits.

2. DC CURRENT METER

Current range: 200mA, 20A

Note: High-precision current meter maybe used.

3. RF DUMMY LOAD

1) Impedance: 50Ω, 150Ω
2) Dissipation: 100W continuous or greater

4. BIRD WATT METER

Dissipation: 100W continuous or greater

5. DRIVE (EXCITER)

Input: 16 to 20 watt ex. TS-120V

6. POWER SUPPLY

13.8V, 20A min. PS-30 or higher class.

PREOPERATION

1. Remove the upper and lower cases as shown below Figure 11.
2. Power supply voltage is 13.8V 20A operation.
3. Disconnect PAB (red wire) in the PA unit and red wire of rear panel.
4. Disconnect the ANT coaxial cable between exciter (TS-120V) and Linear amp (TL-120).
5. If power transistor are changed in the PA unit (X45-1430-00).
   They must be of the same rank.

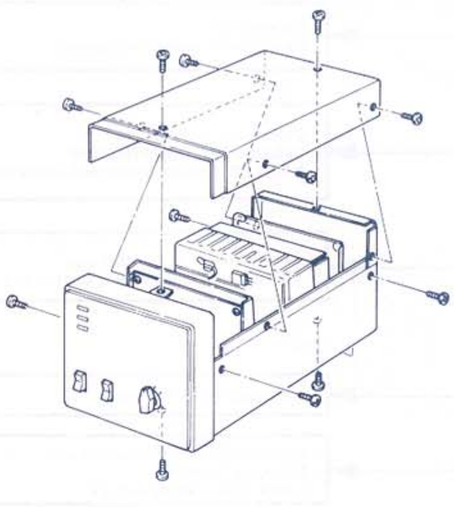


Fig. 11 Case disassembly

SRF1714 (V08-1011-06)

Color	hfe	Color	hfe
Red	20 ~ 32	Blue	57 ~ 78
Orange	28 ~ 42	Violet	72 ~ 93
Yellow	38 ~ 52	Black	87 ~ 108
Green	48 ~ 63	Brown	100 ~ 120

CONNECTION

Connect the Linear amp TL-120 to exciter (TS-120V) as shown below Fig. 12.

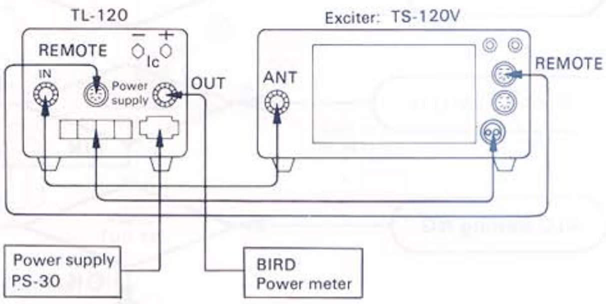


Fig. 12 Connection between TL-120 and exciter (TS-120V)

SETTING

1. EXCITER (TS-120V)

BAND: 14.250 MHz, MODE: CW, STBY SW: REC
CAR VR: Counterclockwise, POWER SW: ON, etc: Free

2. TL-120

POWER SW: OFF, LINEAR SW: STBY, BAND SW: 14 MHz
BAND: 14 MHz
CONTROL UNIT VR1, VR2: Fullclockwise
FILTER UNIT VR1: Fullclockwise

ADJUSTMENT

1. 9V adjustment and check DC-DC converter

- **Instrument**
  1) Voltmeter or Digital voltmeter
- **Adjusting procedure**
  1) Connect the digital voltmeter to TP3 on the CONTROL unit (X53-1150-61) and adjust VR3 on the CONTROL unit for 9.0V ±0.1V.
  2) Connect the digital voltmeter to TP2 on the CONTROL unit (X53-1150-61). Then, turn OPERATE LINEAR SW and check that DC volt is −13.2V ±0.5V.

2. Base current adjustment

- **Instrument**
  1) DC current meter (200 mA, 10A)
  2) Voltmeter

ADJUSTMENTS

● **Adjusting procedure**

1) Connect the current meter between REDWIRE ⊖ and REARPANEL RED WIRE ⊕ in the PA unit (X45-1130-00). Place STBY SW to SEND on the exciter, and after 15 seconds, adjust VR1 on the PA unit for 200 mA.
2) Place STBY SW to REC on the exciter, connect the exciter, ANT terminal TL-120 IN terminal. Then, Connect the voltmeter to Ic terminal on the Linear amp.
3) Place STBY SW to SEND on the exciter, and reduce the CAR VR so the current meter reads 10A. Connect the voltmeter to Ic terminal on the rear panel, and adjust VR4 in the CONTROL unit (X53-1150-61) for voltmeter reading of 0.1V. Then, connect the RED WIRE (FINAL) to REDWIRE on the rear panel.
   * Must be STBY SW to REC, if connect between REDWIRE and REDWIRE (rear panel).

3. ALC adjustment

● **Instruments**

1) Power meter

● **Adjusting procedure**

1) Exciter CAR VR is FULLCLOCKWISE, place STBY SW to SEND. Adjust VR2 on the CONTROL unit (X53-1150-61) until the RF POWER meter reads 95W.

4. Protection adjustment

● **Instrument**

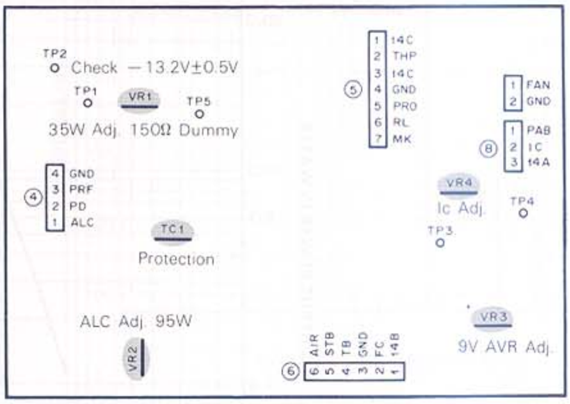
1) Power meter
2) Voltmeter
3) RF dummy load: 150Ω/100W

● **Adjusting procedure**

1) Exciter: 3.750 MHz, TL-120: 21 MHz Band. Turn STBY SW to SEND, maximum output is detained with TL-120. Connect the voltmeter to TP1 on the FILTER unit (X51-1210-00) and adjust TC1 on the FILTER unit for volt reading of dip point.
2) Exciter: 14.250 MHz, TL-120: 14 MHz Band, turn STBY SW to SEND. Connect the voltmeter to TP1 on the CONTROL unit (X53-1150-61) and adjust TC1 on the CONTROL unit for volt reading of dip point.
3) Exciter: 28.000 MHz, TL-120: 28 MHz Band. Turn STBY SW to SEND, and adjust the CAR LEVEL VR so the ALC meter reads Limit of ALC zone. Turn STBY SW to REC, with the BAND to 21 MHz, turn STBY SW to SEND again, adjust VR1 on the FILTER unit (X51-1210-00) so the PRO indicator lights.
4) Exciter: 14.250 MHz, TL-120: 14 MHz Band, connect the BIRD power meter and 150 ohm RF dummy load, then, turn STBY SW to SEND and adjust the CAR LEVEL VR so the ALC meter reads limit of ALC zone, adjust VR1 on the CONTROL unit (X53-1150-61) until the BIRD power meter reads 35W. (FORWARD RF POWER)

PC BOARD ALIGNMENT

CONTROL UNIT (X53-1150-61)



TOP VIEW

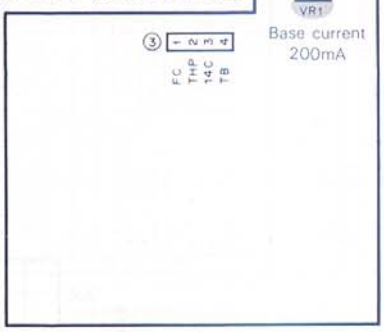
FILTER UNIT (X51-1210-00)

TOP VIEW



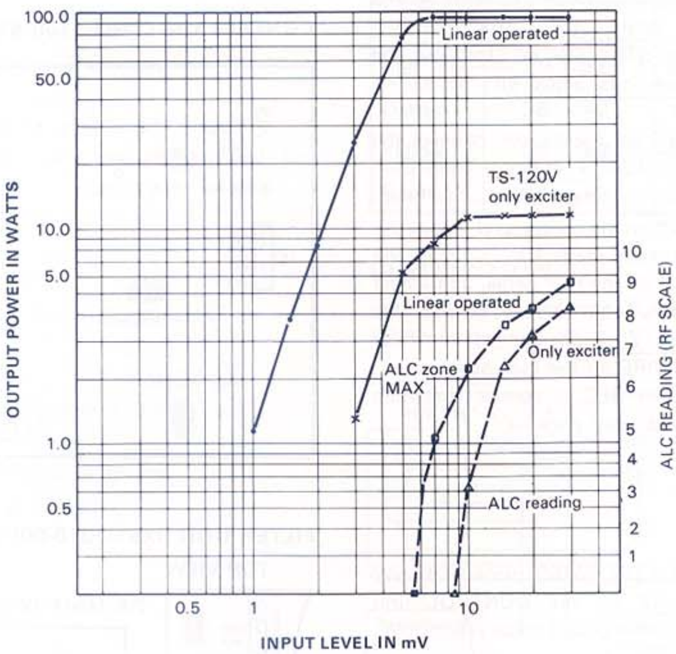
TOP VIEW

PA UNIT (X45-1130-00)



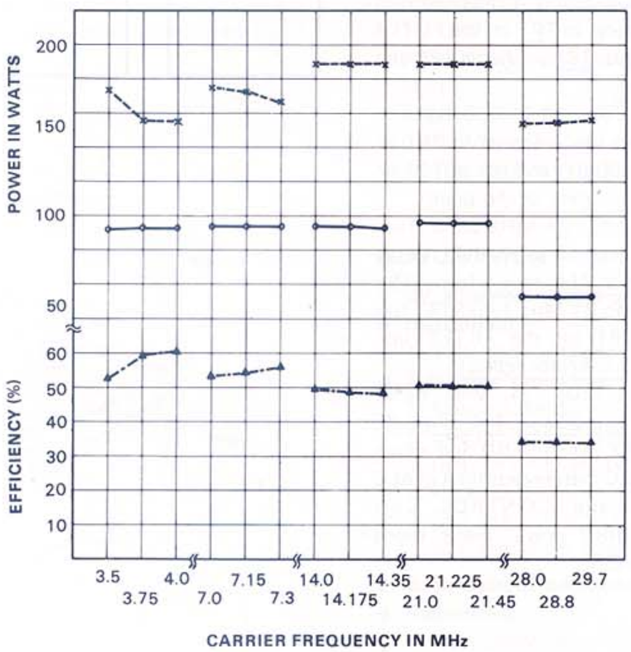
REFERENCE DATA (EXAMPLE)

OUTPUT VS INPUT



SIGNAL FREQ:	: 14.170 MHz
MODE	: CW
MIC GAIN	: 9 O'CLOCK
EXCITER	: TS-120V

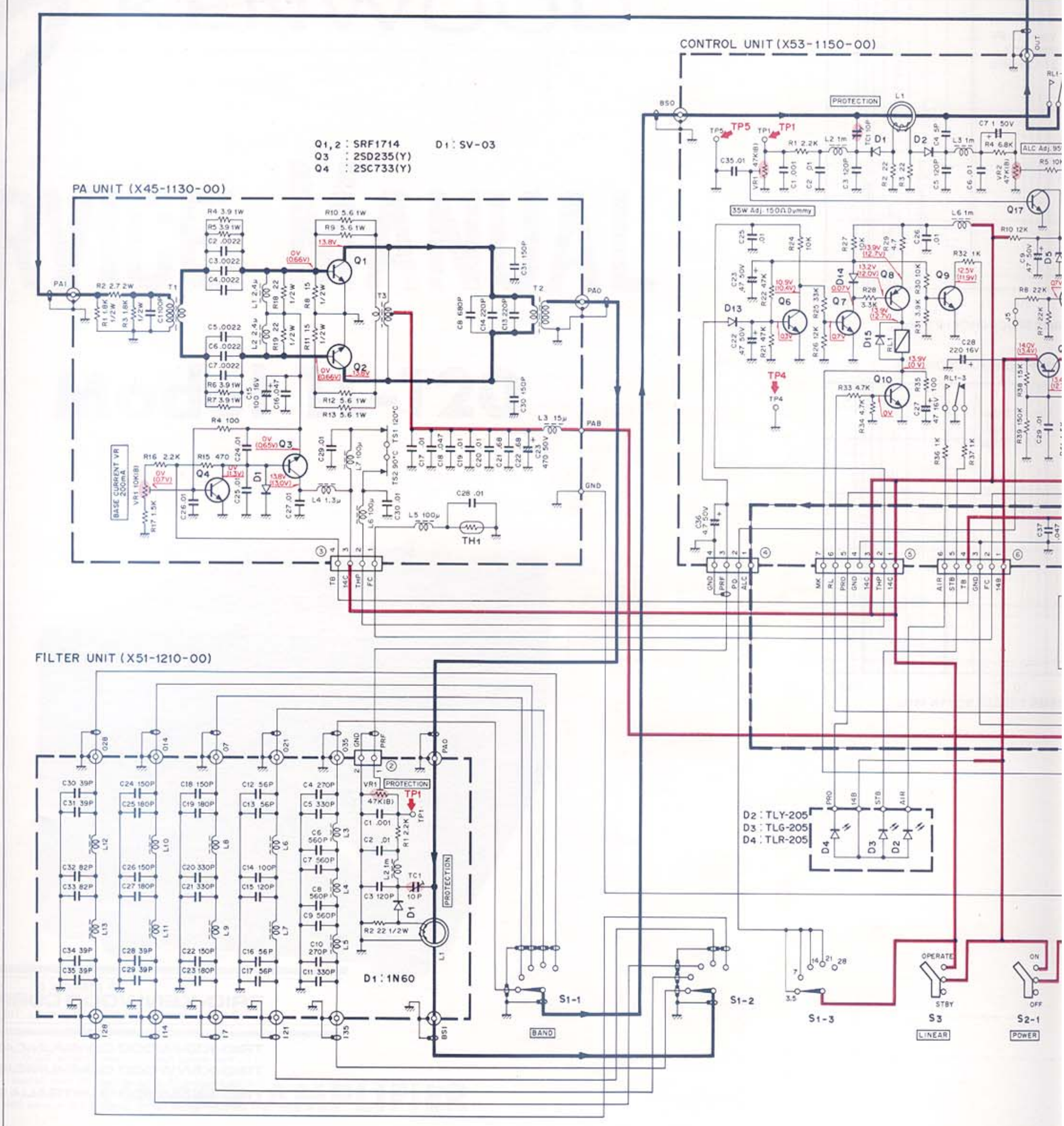
OUTPUT CHARACTERISTIC



SCHEMATIC DIAGRAM

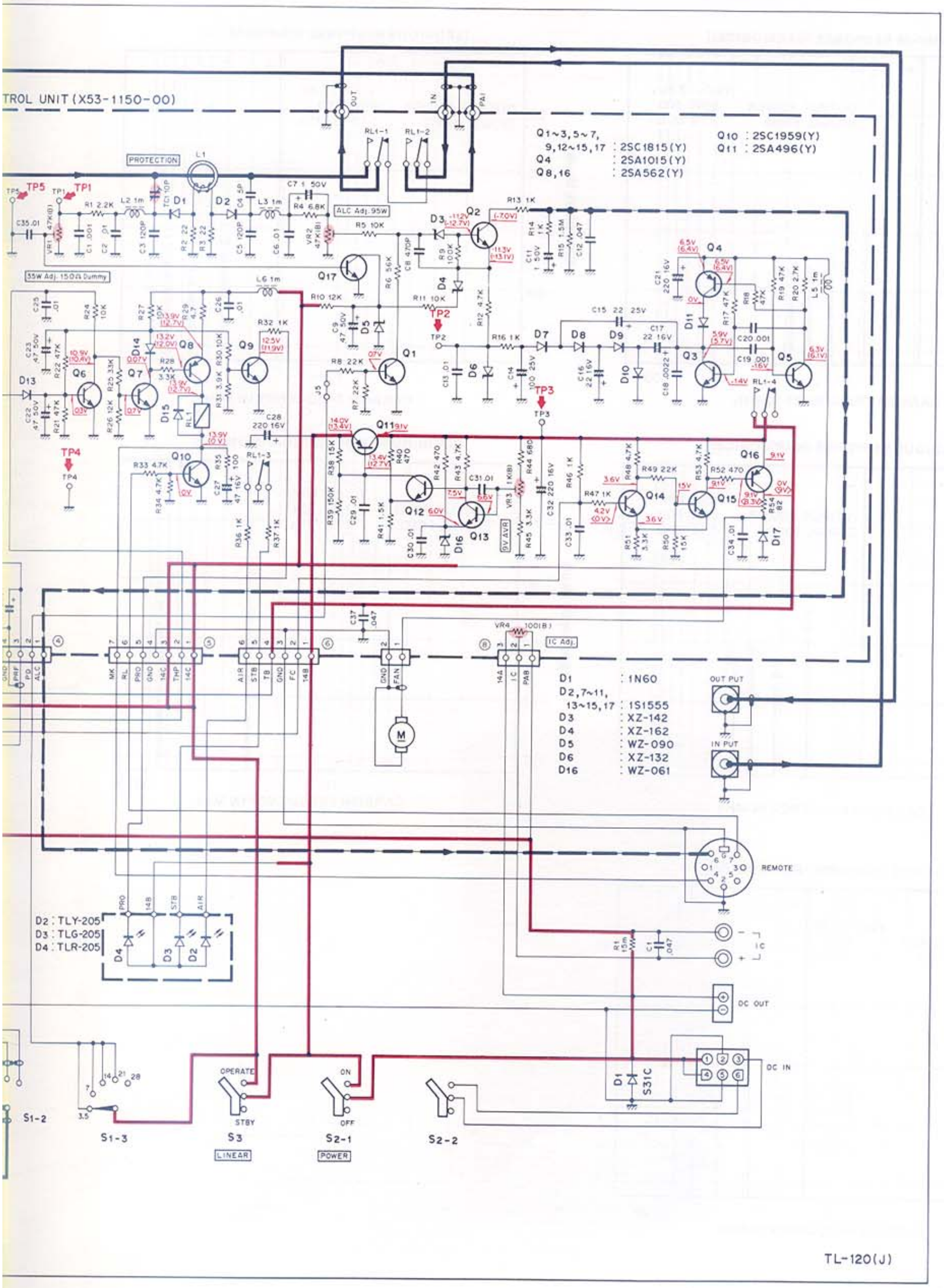
SIGNAL — CONTROL SIGNAL — COMMON VOLTAGE LINE

VOLTAGE: ( ) transmission, < > fan operated.



MATIC DIAGRAM

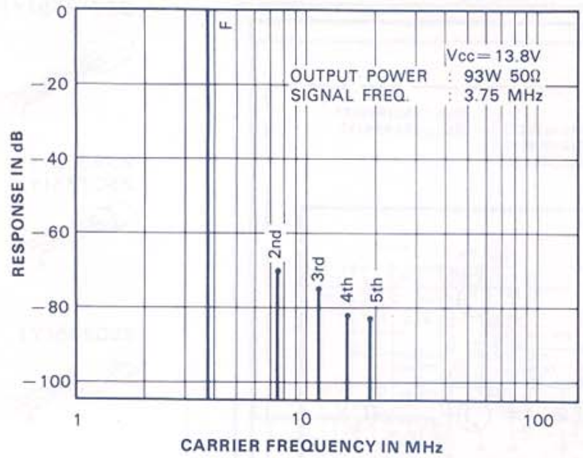
■ The curcuit and ratings change without notice due to developement in technology.



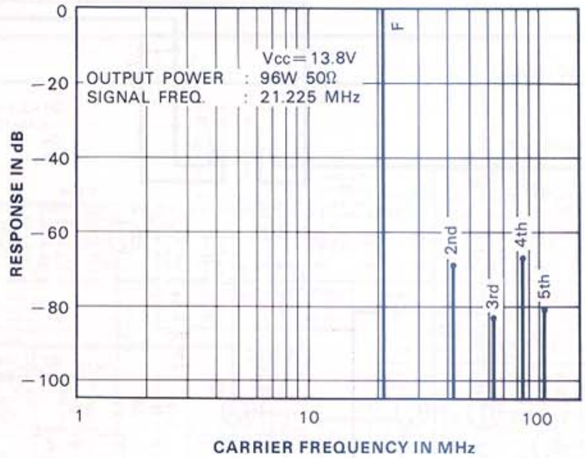


REFERENCE DATA (EXAMPLE)

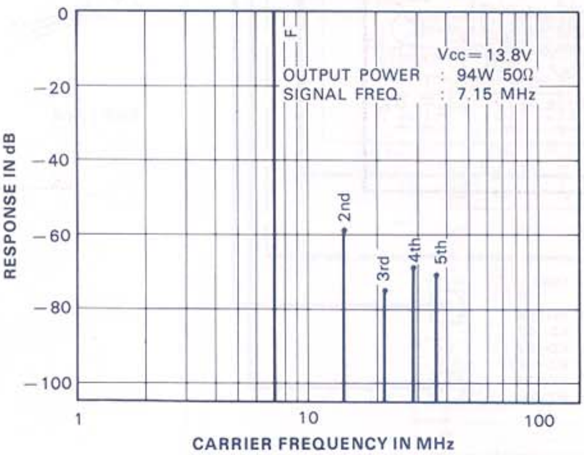
[SPURIOUS RESPONSE (HARMONICS)]



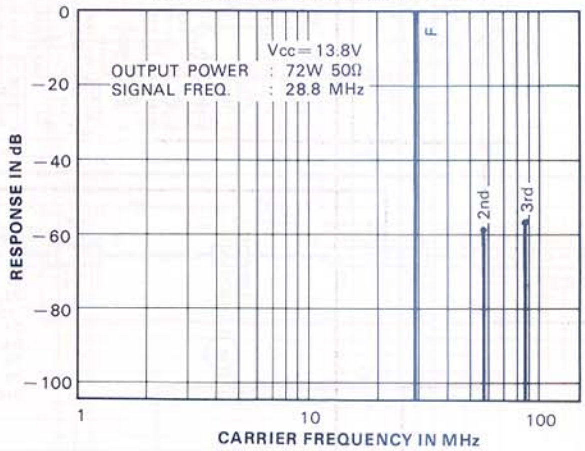
[SPURIOUS RESPONSE (HARMONICS)]



[SPURIOUS RESPONSE (HARMONICS)]



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